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Determination of the Beagle2 Landing Site

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Beagle2 is the UK-led lander element on ESA's Mars Express mission, which will reach Mars in late December 2003. After separation from the Mars Express orbiter 5 days before the atmospheric entry, Beagle2 will descend to the Martian surface by means of ablative heat shields and parachutes. The impact will be cushioned by a set of airbags. The selected landing site at 11.6 deg N / 90.75 deg E (IAU 2000 coordinates) is situated in the south-east of the center of Isidis, a sedimentary basin which is expected to meet the requirements of Beagle's scientific mission, the lander operations, and the entry, descent and landing systems. The exact determination of the Beagle2 landing site is important not only for the Beagle2 and MEX orbiter science investigations (context of the landing site, coordination of science operations with the orbiter, ground truth for orbiter instruments), but also for the reconstruction of Beagle's entry and descent trajectory.

A precise determination of the Beagle2 position is not possible via the MELACOM radio link. Instead, a novel method based on celestial navigation is employed, which utilizes the Stereo Camera System on the lander for imaging the Martian night sky. The position data is then refined by comparing the landing site panorama images with MOLA data (the Laser Altimeter on board the Mars Global Surveyor mission) and high resolution orbiter images. The concept of the celestial navigation method employed for Beagle2 is presented. The accuracy of the method is assessed, and the corresponding error sources are explained. The utilization of MOLA datasets and orbiter images for the detailed lander location is explained, and the potential of celestial navigation in combination with image data analysis for future planetary missions is discussed.